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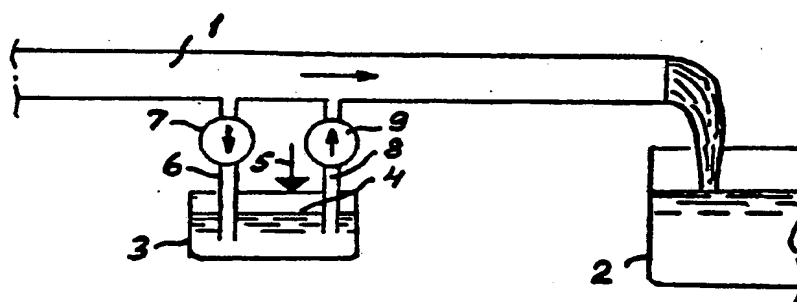
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(54) Title: A METHOD OF AND AN APPARATUS FOR TAKING A SAMPLE FROM A FLUID FLOWING THROUGH A CONDUIT



(57) Abstract

When taking and collecting a representative sample having a relatively small, predetermined volume from a fluid flowing through a conduit (1), a portion is diverted from the conduit during the sampling course and conducted directly from the conduit to a sample container (3) in which the fluid amount after the predetermined volume has been attained is kept constant by withdrawing at a specific fluid flow just as much fluid as is supplied to the conduit, the withdrawn fluid being preferably directed back to the main fluid flow. An apparatus for carrying out the method comprises a fluid flow conduit (1) and a sample receiving container (3) communicating with the conduit through a fluid flow controlling pump (7) and including an outlet (8) for discharging fluid in an amount of the same magnitude as the supplied one.

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A Method of and an Apparatus for Taking a Sample from
a Fluid Flowing through a Conduit.

This invention relates to a method of taking and
collecting a representative sample having a relatively
small, predetermined volume from a fluid flowing
through a conduit and from which a portion larger than
5 the predetermined sample volume is diverted during the
sampling course, the excess of the portion compared to
said volume being withdrawn so as not to be collected
in the container adapted to receive the sample.

Such a method of sampling is for instance prac-
10 tised in connection with tapping milk from suppliers
by tank cars, the analyses on the samples forming inter
alia the basis of settling the accounts with respect to
the quantity of the purveyed milk.

When a producer keeps the milk in a tank under
15 effective stirring, the constituents may be expected to
be uniformly dispersed so that any portion is identi-
cally composed. In this respect a spot test may reason-
ably be considered to be representative of the total
quantity. If the milk has not been kept stirred, a re-
20 presentative sample of e.g. 30 to 50 ml taken from a
delivered amount of 100 to 10000 l may be obtained in
the way that during pumping from supplier's tank to the
tank car a liquid amount proportionate to the main
fluid flow is diverted to the sample container, the
25 operator being capable of adjusting the factor of pro-
portionality from a reasonably exact estimate of the
total amount of milk and the magnitude of the desired
sample.

The same cannot be done if the fluid amount is
30 not known. This is typically the case in quite other
connexions, for instance when sampling waste water from
conduits, but it also occurs when taking samples of

milk where it is desired to avoid the uncertain factor caused by an estimate of the total amount of milk. In that case it is known to make use of a proportional sampler through which part of the main flow of milk is diverted to a suitably large intermediate store in which the milk is subjected to stirring and from which a sample of the desired volume is eventually tapped off to the sample container while the residue from the intermediate store is re-united with the main quantity. A disadvantage of said method is that the intermediate store to some degree complicates the required equipments, but a still more severe objection is that the problem of so-called "over-dragging" intensifies. The over-dragging is due to the fact that the tank car in the same turn fetches milk from more or many suppliers and that the milk residues from one delivery may cause a falsification of the sample taken from the following delivery, unless a thorough cleaning and rinsing of the equipments (including the intermediate store) is effected between two deliveries which, however, will cause great difficulty in practice.

The method according to the invention differs from the last mentioned, prior method in that said portion is conducted directly from the conduit to the sample container and that the fluid amount therein after the predetermined volume has been attained is kept constant by continuous supply of fluid to and withdrawal of fluid from the sample container, the fluid flow to and from the container at any moment being proportional to the product of the predetermined volume and the simultaneous fluid flow in the conduit and inversely proportional to the fluid amount which until the specific moment has flown through the conduit. It should be ensured that the fluid withdrawn from the sample container may at any time be held to have the same composition as the total content of the

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sample container in order that this content may continuously be representative of the main quantity.

In the method according to the invention the obtaining of a representative sample requires neither
5 pre-knowledge of the total amount from which the sample is to be taken nor is there any need for an intermediate store from which a sample is to be taken at a suitable moment. The method implies that a proportional sample is taken at first till a predetermined volume
10 has been attained, following which the continuous supply and discharge of sample fluid while observing the determined fluid flow cause such a regulation or updating of the original proportional sample that the sample will continuously be representative of the fluid
15 amount that has flown through the conduit at the diversion point and, at the termination of the sampling course, will actually be representative of the total amount of fluid, for example the amount of milk transferred from a supplier to a tank car.

20 According to circumstances, the fluid discharging from the sample container may be withdrawn arbitrarily, but it should frequently again join the main fluid flow, conveniently by being directed back to the conduit.

25 The invention also relates to an apparatus for carrying out the explained method, said apparatus comprising, in a known manner, a fluid flow conduit and a samples receiving container. Such an apparatus is according to the invention characterized in that the
30 samples receiving container communicates with the conduit through a fluid flow controlling pump and includes an outlet for discharging fluid in an amount of the same magnitude as the supplied one.

The outlet may be a simple overflow, but it is
35 generally preferred that the outlet of the samples receiving container is in communication with the conduit.

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over a likewise adjustable pump, inter alia because losses in fluid may then be eliminated.

The invention is illustrated in the drawing by a schematical view of the apparatus concerned.

5 The apparatus of the illustrated embodiment includes a conduit 1 which in the direction of the marked arrow is through-flown by a fluid from a store, not shown, for example a milk storing tank on a farm, to a collecting tank 2 or other recipient.

10 3 is a samples receiving container adapted to accommodate a predetermined volume of fluid till a level 4 is reached and in which a level sensor 5 is provided. The container 3 is in communication with the conduit 1 through an inlet tube 6 provided with an adjustable pump 7 and in the illustrated embodiment it is further connected with the conduit 1 through a discharge pipe 8 having a pump 9 which after the level 4 has been reached operates with the same capacity as the pump 7.

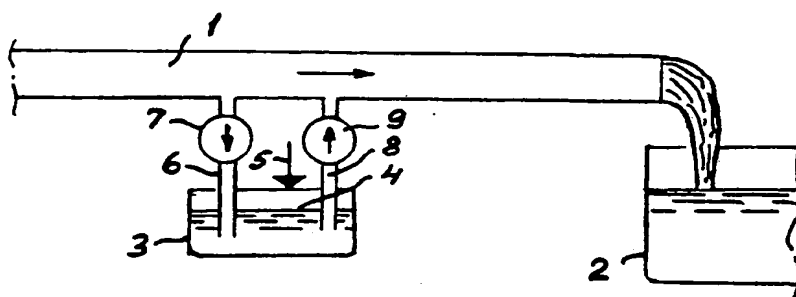
20 The mode of effect of the apparatus appears from the above explanation and it will be understood that the level sensor 5 according to requirement may serve as signaller for controlling the pumps 7 and 9.

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P A T E N T C L A I M S

1. A method of taking and collecting a representative sample having a relatively small, predetermined volume from a fluid flowing through a conduit and from which a portion larger than the predetermined sample volume is diverted during the sampling course, the excess of the portion compared to said volume being withdrawn so as not to be collected in the container adapted to receive the sample, characterized in that said portion is conducted directly from the conduit to the sample container and that the fluid amount therein after the predetermined volume has been attained is kept constant by continuous supply of fluid to and withdrawal of fluid from the sample container, the fluid flow to and from the container at any moment being proportional to the product of the predetermined volume and the simultaneous fluid flow in the conduit and inversely proportional to the fluid amount which until the specific moment has flown through the conduit.
2. A method as claimed in claim 1, characterized in that the fluid discharging from the sample container is directed back to the conduit.
3. An apparatus for carrying out the method as claimed in claim 1 or 2 and comprising a fluid flow conduit (1) and a samples receiving container (3), characterized in that the samples receiving container (3) communicates with the conduit through a fluid flow controlling pump (7) and includes an outlet (8) for discharging fluid in an amount of the same magnitude as the supplied one.
4. An apparatus as claimed in claim 3, characterized in that the outlet of the samples receiving container (3) is in communication with the conduit (1) over a likewise adjustable pump (9).


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INTERNATIONAL SEARCH REPORT

International Application No PCT/DK88/00048

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) *		
According to International Patent Classification (IPC) or to both National Classification and IPC ⁴		
G 01 N 1/20		
II. FIELDS SEARCHED		
Minimum Documentation Searched ⁷		
Classification System	Classification Symbols	
IPC 4	G 01 N 1/10, 1/14, 1/18, 1/20	
US C1	73: 421, 422, 425, 425.2, 425.4R, 425.6, 863.01, 02, 03, 81, 83 864.34	
Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched *		
SE, NO, DK, FI classes as above		
III. DOCUMENTS CONSIDERED TO BE RELEVANT *		
Category *	Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages ¹²	Relevant to Claim No. ¹³
Y	DK, C, 86 749 (PETER SKJØDE KNUDSEN) 12 January 1959	1-4
Y	US, A, 3 896 673 (AUDOUZE et al) 29 July 1975 & NL, 7307505 LU, 67680 FR, 2187115 DE, 2327427 BE, 800114 GB, 1380544 CA, 994127 CH, 580276	1-4
Y	EP, A1, 0 039 668 (PROCESS-INSTRUMENT I KROKOM AB) 11 November 1981 & SE, 421651	1-4
A	DE, A1, 2 833 836 (MKT-TEHTAAT OY) 22 February 1979	
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IV. CERTIFICATION		
Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report	
1988-06-17	1988-06-22	
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